Form ESA-B4 Summary Report for United States Steel Corporation
Edgar Thomson Plant, Braddock, PA
ESA-139-3 Public Report - Final

Company	United States Steel Corporation	**ESA Dates**	21 – 24 July 2008
Plant	Edgar Thomson Plant	**ESA Type**	Fan
Product	Steel	**ESA Specialist**	Ron Wroblewski

Brief Narrative Summary Report for the Energy Savings Assessment:

Introduction:
In many cases the only readily available information was power and pressure, so without flow information we could not accurately determination system efficiency, but we were able to verify that it would be very wise to do an airflow study to measure the performance of all of the fans in this report according to AMCA standard 203. Many potential opportunities were identified and all require further study in order to bring these projects into better focus for possible implementation.

Objective of ESA:
Identify energy efficiency opportunities in fan systems and train plant staff in how to use FSAT software.

Focus of Assessment:
The assessment focused on the large fans serving the key areas of the process. Key fans serving the BOP, the casting, the LMF were reviewed. In addition to providing a half-day training course and visually reviewing the fans, Ron attended a meeting of the plant energy committee, which coincidentally was the same day as the ESA.

Approach for ESA:
The ESA was a little different than other ESAs in that the writer, Ron Wroblewski, was invited to attend a meeting of the energy team for the Mon Valley Works (All parties agreed afterward that it was very useful to have Ron at the meeting), but it did cut into time normally spent gathering data and analyzing fan systems. Monday afternoon, Ron arrived on-site and got an overview of the fans. Tuesday, AM was spent talking to operators, and examining the Boiler Fans. Tuesday afternoon was the energy management team meeting and Wednesday we reviewed the operation and physically examined the BOP fans, the mixer fans, and in the afternoon, the fugitive fans and the caster fans. Thursday Morning was the ½ day training, and Thursday afternoon was an “all hands” mandatory plant staff meeting. So unfortunately, no U. S. Steel staff members were available to gather last bits of missing information required to wrap up the assessment the last afternoon, although an employee was able to show me the spare impellers.

General Observations of Potential Opportunities:
- Total plant natural gas consumption is 2,298,380 MMbtu/yr
- Total plant electricity consumption is 180,079,000 kWh
- Peak electricity demand is 25,696 kWh.

As part of the ESA a large number of fans were looked at. Unfortunately however, in all cases complete information regarding the flow, pressure or power was not available. In cases where the fan system exhibited some visible signs of inefficiency, we have attempted to estimate the unknown parameters. In cases where there were no visible signs of inefficiency, we gathered enough information to only estimate operating cost. There could be many more opportunities for fan efficiency improvements, but we were not able to confirm or deny due to lack of hard data.

BOP “A” & “B” Fans – Long Term Opportunity
Replace pollution control equipment and upgrade fans. Potential Savings $1 Million per year.
The current BOP “A & B” Fans are direct-driven, each by a 4000 hp medium voltage motor. FSAT results based on preliminary estimates indicate the two fans together cost over $1.2 Million per year to operate. The fans develop approximately 85 inches of pressure for the venturi scrubber, but the venturi does not currently work very well because it requires more pressure than the fan is capable of developing.

In the short term it will be advantageous to add chevron style turning vanes at the inlet of the fan and at the base of the stack. Smoothing these transitions and re-engineering the water separator to a different configuration with a lower pressure drop could free up about 8-10 inches of the fan's pressure capability. This pressure capability could be used to better serve the current venturi, in order to achieve better air cleaning.

In the medium term, re-configuring the pollution control equipment to use an electrostatic precipitator, and new fans that are matched to the lower pressure drop can reduce the energy usage of this system by 80%. An airflow study is needed in order to more completely understand the current configurations so that any changes can be carefully engineered. This should be done in conjunction with the heat recovery project described in the next item.

BOP – Medium Term Opportunity
Install new waste heat recovery Boiler(s). Potential Savings $7.1 Million per year
The Basic Oxygen Process (BOP) Furnace generates a tremendous amount of heat in the form of hot gas coming off of the vessel, particularly during the blow portion of the cycle. Measurements of the stack flow indicate approximately 200,000 scfm of gas handled by the A&B scrubber fan. This gas is originally approximately 2,000 ^{o}F, which is diluted with tramp air and quenched with water sprays to cool the gas. Using a heat recovery boiler to cool off the gas can recover approximately 185 Million btu/hr, or 1,575,050 Million btu per year. A waste heat boiler here could replace another fuel used to generate steam, saving over $7 Million per year. If it is not practical to use the steam in the process, then it may be possible to use the steam to generate up to 16,000 kW of electrical power. The heat recovery boiler could also reduce the use of cooling water by up to 40 million gallons per year. This is based on very preliminary data, assumptions and estimates. Further study is needed to better establish costs and savings.

Boiler ID Fans – Medium Term Opportunity
Use three new medium voltage ASDs to power the Boiler ID fans. Potential Savings $126,000 per year
The 3 Boiler ID fans are direct-driven by 900 hp medium voltage motors. Currently the fans are controlled with inlet box dampers that lend the appearance of inefficient operation. Flow measurements are not available for these fans, so we were unable to confirm the operating efficiency. Consideration is being given to the use of adjustable speed drives for these fans, but without knowing the flow there is not enough information to verify that the ASDs will have an adequate return on investment. Preliminary data indicates that the payback may be over 6 years for these drives. Other data however, indicates a much higher energy usage on these fans, which would suggest correspondingly higher potential savings. An airflow study is required to resolve the differences in estimates in order to more accurately predict the possible savings.

Fugitive Exhaust Bag House – Medium Term Opportunity
Reconfigure system with smaller, more efficient fans driven by ASDs Potential Savings $388,000 per year
The fugitive exhaust bag house system consists of 10 fans on the dirty side (upstream) of the bag house, each controlled by a discharge damper, and each driven by a 400 hp medium voltage motor. For approximately 15% of the time, the dampers are fully open, (capture mode), about 75% of the time the dampers are partially closed (stand-by mode), and 10% of the time the damper is fully closed (cleaning mode). Reconfiguring the system with smaller, more efficient fans on the clean side of the baghouse, that are driven by adjustable speed drives could save approximately $388,000 per year.

Mixer Bag House – Near term Opportunity
Switch off fans 10 minutes every 2 hours during bag house cleaning cycle Potential Savings $21,700 per year
The Mixer bag house system consists of 12 fans, each belt driven by a 100 hp 460 Volt motor. The baghouse system costs approximately $262,000 per year to operate. Before implementing this strategy on all fans, a test should be run on one or two of the fans to see the effect of cycling the motor off during the cleaning cycle. The belts may need to be upgraded to a more modern and durable type to handle an additional 12 start/stops cycles per day.

Other Fan Systems Reviewed:
No opportunities were identified in the following systems due to a lack of flow and pressure data. Baseline operating costs are presented below. An airflow study is required to determine the efficiency of the fans so they can be evaluated for upgrade.

Caster Exhaust –
A total of four fans serve the caster exhaust. Two are direct driven by 200 hp 1200 rpm motors, and two are direct driven by two 125 hp 1200 rpm motors. In all cases the motors seem lightly loaded. Amp readings suggest that all four motors are loaded to about 60 hp, so there appears to be some over-sizing of the motors. All four of these motors together cost about $80,000 per year to operate. An airflow study is needed to determine, flow, pressure, power and efficiency, in order to see if an efficiency improvement opportunity exists.

Management Support and Comments:

DOE Contact at Plant/Company: (who DOE would contact for follow-up regarding progress in implementing ESA results…)

Ken Mills (Corporate Energy Manager Leader)
219-888-3930
KWMills@uss.com